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(71) Applicants
Marcelo Chiquilar Arias,
Insurgentes Sur 403,
1st Floor,
Mexico,
D.F. Mexico.
(72) Inventors
Marcelo Chiquilar Arias
(74) Agents
Langner Parry

(54) Prophylactic unit-dose container

(57) An improved prophylactic unit-dose container comprises a flexible body 1, a rigid nozzle 2, a breakable tip 3. The tip being removable upon torsional force being applied thereto, and a cap 4 having a cavity engageable with the external walls of the nozzle and with tip 3, rotation of the cap removing the tip. The tip and its corresponding cap cavity 6 may be of e.g. square, triangular, hexagonal or star-shaped cross-section.

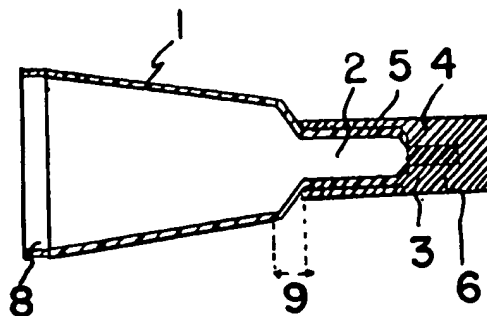
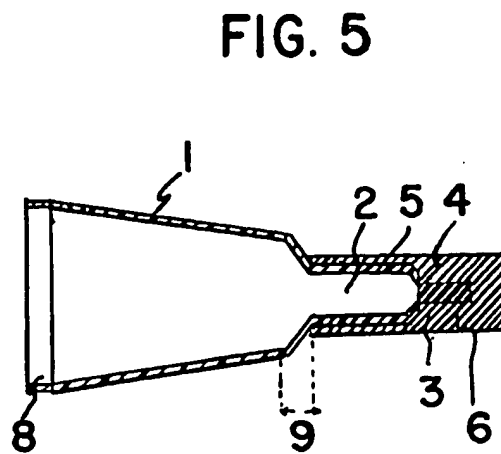
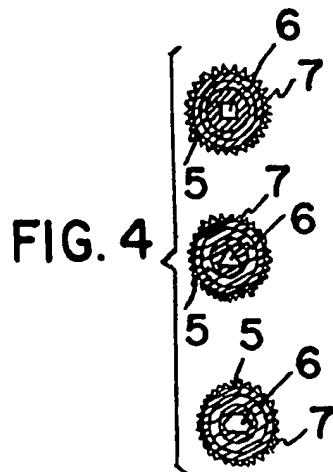
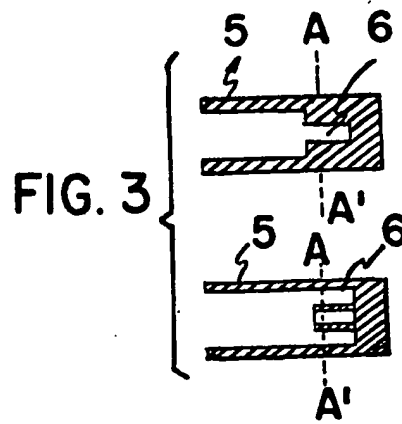
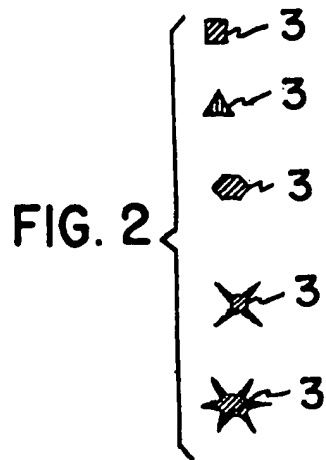
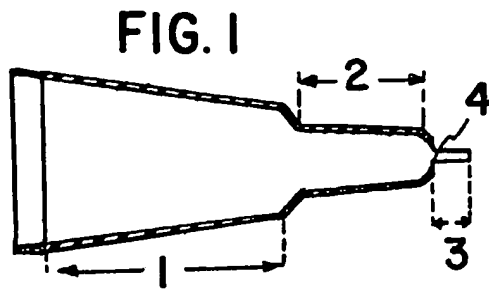


FIG. 5

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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SPECIFICATION

Phrophylactic unit-dose container

5 The present invention relates to improved containers for medical solutions and the like.

It has been of primary interest for a long time, and even more so lately, since hydrophylic or soft contact lenses were introduced, to deal with the
 10 hygienic and health problems associated with the storing of the medical solution in the currently used multi-dose containers.

The contamination of the medical solutions is due to their storage in the multi-dose containers for a given length of time, even though they have been
 15 bottled under sterile conditions, since sterility is lost once the container has been opened for dispensing the first dose.

In order to solve this problem, many medical solutions include preservatives which have a limited effectivity and depend on the period of time the
 20 containers remain open; the medical solution eventually becomes contaminated.

Due to the above, various types of unit-dose containers have been invented, which, unfortunately, have not totally solved the already mentioned
 25 problem, as such containers are opened with the fingers, which are generally contaminated, or with accessories such as scissors, pins, etc., which can also be contaminated.

Applicant developed the container as disclosed in U. S. Patent No. 3,777,949, which includes a flexible body and a rigid conical nozzle of a sufficient size as to allow the container to be held in one hand while
 30 removing a breakable tip with the fingers of the other hand by applying a torsional force to said breakable tip, without losing part of the medical solution or touching the resulting orifice with the fingers. Nevertheless, it was necessary for the user
 35 to take particular care in positioning his fingers sufficiently far from where the tip is removed so as not to touch the orifice, a precaution which not all of the users take. To deal with this problem a cap
 40 opener was provided which had an internal conical cavity with an apex angle smaller than the apex angle of the conical nozzle so that the periphery of the open end of the cap opener would grasp the external surface of the conical nozzle or of a conical
 45 container portion, containing the liquid of the container, at some point rearwardly of where the orifice would be formed when the breakable tip was twisted off the nozzle. The opposite end of the internal cavity of the cap opener was shaped to grip the breakable
 50 tip, which generally had a rectangular cross-section, with the internal surface of the closed opposite end of the cap opener also having a matching rectangular-cross-section. The cap opener shielded the user's
 55 fingers, holding the cap opener, from the orifice, when formed, and the adjacent nozzle. However, very frequently the cap opener became separated from the nozzle and got lost, forcing the user to use his fingers again in order to open the container.

A main object of the present invention is to prevent the container from being opened with the
 60 fingers and the cap opener from being easily

separated from the container. This can be achieved with the improved container of the present invention due to its characteristics of a flexible body, and rigid nozzle and a breakable tip of appropriate configuration and size so as to make the torsion with the
 70 fingers difficult and to be fit substantially exactly with the corresponding interior shape of the cap opener.

In accordance with the present invention there is provided an improved prophylactic unit-dose container, which comprises a flexible body, a rigid
 75 nozzle and a breakable tip at the end of said nozzle, said tip being adapted to open the end of the nozzle upon torsional force being applied to said tip, said
 80 nozzle for a substantial portion of the length thereof having substantially parallel external sides, and a cap opener having a cavity with substantially parallel interior walls of the cap opener being engageable with the parallel external walls of the nozzle and
 85 being adapted to releasably grasp said walls of said nozzle.

Reference is now made to the accompanying drawing illustrating specific embodiments of the invention, wherein:

90 *Figure 1* shows a longitudinal cross-section of a container in accordance with the present invention;

Figure 2 shows in a transverse cross-section, 5 possible forms for the container frangible tip;

95 *Figure 3* shows in longitudinal cross-section two possible types of cap openers;

Figure 4 shows a view in transverse cross-section, taken along line A-A' of the cap opener, with three orifices for three of the container tip forms, shown in *Figure 2*; and

100 *Figure 5* shows a longitudinal cross-section of the sealed container-filled, and with its cap opener.

The following reference numerals appear:

- 1 - Container compressible body.
- 2 - Rigid nozzle.
- 105 3 - The tip breakable by torsion.
- 4 - Orifice for ejection of contents once the tip has been removed.
- 5 - Rigid body of the cap opener.
- 6 - Rearward cavity of the cap opener, corresponding to the tip form (3).
- 110 7 - Grooved wall of the cap opener.
- 8 - Sealed posterior end of the container sealed once the container has been filled up.
- 9 - Exposed portion of the rigid nozzle for holding the container with the fingers during the torsional movement of the cap opener.

It will be noted that the nozzle 2 for a substantial portion of its length has substantially parallel walls, and the cap opener 5 also has substantially parallel walls at its cavity and engages with the parallel external walls 2 of the nozzle. The opposite walls can vary slightly from being completely parallel to each other, preferably not to exceed making an apex angle of 10°. If the apex angle exceeds this amount, the cap opener can readily slide off of the nozzle, which was one of the problems of the prior art device. It is preferred that the length of the nozzle portion be a minimum of one-quarter of an inch and not exceed one-inch, said length usually being about
 120 one-half inch. The tip portion 3 usually has a length
 130

of about three-sixteenths of an inch but can vary from about one-eighth of an inch to about three-sixteenths of an inch. The diameter of tip 3 is about one-sixteenth of an inch. At any rate, the size of tip 3 is such that it cannot be readily grasped by human fingers. Of course, the shape of the orifice 6 in the cap opener, that is, the rearwardly spaced cavity, is complementary to the tip 3.

In the preferred embodiment of the invention, the cap opener 5 has an inwardly positioned, rearward cavity 6 corresponding the form of the tip 3 spaced rearwardly from a forward substantially smooth-walled cavity 2 for releasably grasping the substantially smooth-walled nozzle 2, said rearwardly spaced cavity 6 having substantially parallel walls, the breakable tip 3 of the container also having parallel walls, the cross-section of the parallel walls of said breakable tip and the inner cavity 6 of the cap opener 5 having matching, non-circular cross-sections of a configuration symmetrically disposed about the central axis of said tip and said cap opener, whereby said cap opener and said tip can be engaged in a plurality of positions upon rotation of the cap opener about said axis relative to the tip prior to said engagement of said rearward cavity of the cap opener with the tip 3 of the nozzle 2. As shown in Figure 2, the cross-section can be square, triangular, hexagonal, or star-shaped. Figure 4 shows matching cross-sections for the cavity 6 corresponding to the first three embodiments of Figure 2.

In addition to the above, there is a current problem, created by introduction of the hydrophilic or soft contact lenses, which are easily contaminated as they absorb liquids such as water, tears and the solutions used with them, wherein they act as a sponge, which action turns them into soft lenses. The solutions they absorb may become contaminate. To prevent the latter, the solutions for said soft lenses include preservatives, as they are currently packaged in multi-dose containers which besides averting the problems of sterility and loss of effectiveness, can create new problems, wherein the preservative is also absorbed by the soft lenses and by eventual accumulation whereby rinsing does not completely eliminate the preservative. The preservative tends to become adhered to the plastic material of the lens. This accumulation of preservative eventually creates problems, such as would be damaging to the corneal tissues of the eyes as well as to damage the soft lens itself. The combination of the container with the cap opener according to the present invention solves this problem by providing a single-use container wherein the tip and orifice are not contacted by the fingers, thereby eliminating the need for a preservative. Since the interior smooth walls of the cap opener grasping the exterior smooth walls of the nozzle 2 do not permit the cap opener to remain substantially fixedly attached to the nozzle 2, the cap cannot be utilized to close the container after partial use. However, the cap is sufficiently snug when in position that it will not readily fall off, whereby the cap can readily be used to twist off the tip portion 3 just prior to use and permit the entire device, the combination of the cap and the container,

to be suitably packaged. The ability to have the cap opener 5 removed from the nozzle 2 also permits inspection of the device after manufacture, that is, to insure that the tip is properly connected to the nozzle and is not possibly broken prior to its removal just prior to use.

CLAIMS

1. An improved prophylactic unit-dose container, which comprises a flexible body, a rigid nozzle and a breakable tip at the end of said nozzle, said tip being adapted to open the end of the nozzle upon torsional force being applied to said tip, said nozzle for a substantial portion of the length thereof having substantially parallel external sides, and a cap opener having a cavity with substantially parallel interior walls of the cap opener being engageable with the parallel external walls of the nozzle and being adapted to releasably grasp said walls of said nozzle.
2. A container according to claim 1, wherein the cap opener has an inwardly positioned cavity spaced rearwardly from a forward cavity for grasping the nozzle of the container, said rearwardly spaced cavity having substantially parallel walls, the breakable tip portion of the container also having parallel walls, the cross-section of the parallel walls of said breakable tip and the inner cavity of said cap opener having a matching non-circular cross-section of a configuration symmetrically disposed about the central axis of said tip and said cap opener whereby said cap opener and said tip can be engaged in a plurality of positions upon rotation of the cap opener about said axis relative to the tip prior to said engagement of said rearward cavity of the cap opener with the breakable tip of the nozzle.
3. A container according to claim 2, characterized by the fact that the cross-section of the breakable tip and of the rearwardly spaced cavity of the cap opener is square.
4. A container according to claim 2, characterized by the fact that the cross-section of the breakable tip and of the rearwardly spaced cavity of the cap opener is triangular.
5. A container according to claim 2, characterized by the fact that the cross-section of the breakable tip and of the rearwardly spaced cavity of the cap opener is hexagonal.
6. A container according to claim 2, characterized by the fact that the cross-section of the breakable tip and of the rearwardly spaced cavity of the cap opener is star-shaped.
7. A container substantially as herein described with reference to and as illustrated in the accompanying drawings.